APPLICATION UNDER UNITED STATES PATENT LAWS

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Invention: Device For Feeding Filter Rods In A Filter Tip Attachment Machine

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This is a:

- ☐ Provisional Application
- ☐ Regular Utility Application
- ☐ Continuing Application
  - ☐ The contents of the parent are incorporated by reference
- ☒ PCT National Phase Application
- ☐ Design Application
- ☐ Reissue Application
- ☐ Plant Application

SPECIFICATION

This application is the national phase of international application PCT/IB2004/003531 filed October 27, 2004 which designated the U.S. and that international application was published under PCT Article 21(2) in English. This application claims priority to Italian Patent application number BO2003A 000641, filed October 31, 2003, which is incorporated by reference herein.

Description

A device for feeding filter rods in a filter tip attachment machine

Technical Field

The present invention relates to a device for feeding filter rods in a filter tip attachment machine.

Background Art

The term filter rod is used to describe a stick of filter material, prepared to a predetermined length and subjected to a cross-cutting step from which two or three filter plugs are obtained, each twice the length of a single tip destined ultimately to form part of one filter cigarette.

More particularly, the present invention relates to a roller by which single filter rods are taken up from the bottom of a feed hopper.

The outer cylindrical surface of the take-up roller coincides with the bottom of the hopper and is furnished with a plurality of aspirating flutes positioned to receive the single filter rods, in such a way that when the roller is set in rotation, the rods can be transferred away from the hopper and directed through one or more cutting stations where they are divided into plugs, thence toward a station where they are transferred to a further roller.

The single flutes function primarily as elements by means of which to retain the single filter rods, but also as steadying elements with which one or more disc cutters, rotating about respective axes parallel to the axis of rotation of the take-up roller, are able to interact during the cutting step.

More exactly, the cutter or cutters operating at one or more relative stations will pass through respective radial gaps afforded by the take-up roller, extending transversely to each flute, in such a way as to slice likewise transversely through the filter rod.

Where the intention is to obtain two plugs from a single filter rod, there will be just one disc cutter operating on the path followed by the flutes between the take-up area and the point of transfer to the next roller, and the flutes themselves will present a single gap, positioned intermediately to coincide with the area where the cutting edge of the disc passes through the rod.

If the intention, on the other hand, is to obtain three plugs of equal length from a single filter rod, there will be two disc cutters operating along the path followed by the flutes between the take-up area and the point of transfer to the next roller, distanced one from the other along a direction parallel with the axis of the take-up roller.

Accordingly, the flutes will present two mutually parallel gaps placed to coincide with the areas where the cutting edges of the discs pass through the rod.

In the light of the foregoing, it follows that if a filter tip attachment machine has been set up to divide filter rods into two plugs, for example, then in the event of production requirements dictating subsequently that the rods be divided into three plugs rather than two, not only will the number of disc cutters need to be altered, but the take-up roller itself must also be changed.

Again, it will be evident that the take-up roller must be replaced, still assuming a situation where plugs are cut from each filter rod, in the event of production requirements dictating a change in the length of the filter tip. In effect, it is the length of the filter plug that determines the distance separating the cutters, hence the distance between the relative gaps, and accordingly, if the size of the filter tip is altered, then not only will the distance between the cutters need to be adjusted, but the take-up roller must be changed as well.

The object of the present invention is to set forth a device for feeding filter rods in a filter tip attachment machine, such as will allow of overcoming the drawbacks mentioned above.

Disclosure of the Invention

The stated object is realized in a device for feeding filter rods in a filter tip attachment machine, as recited in claim 1 appended.

The invention will now be described in detail, by way of example, with the aid of the accompanying

drawings, in which:

-figure 1 shows a device for feeding filter rods in a filter tip attachment machine, viewed schematically from the front and with certain parts omitted;

-figures 2 and 3 show a take-up roller of the feed device in figure 1, viewed schematically from the side in an axial section, and illustrated in two different operating configurations;

-figures 4 and 5 show the take-up roller of the feed device in figure 1, viewed schematically from the side in an axial section, and illustrated in two further different operating configurations;

-figure 6 shows the take-up roller of figures 1 to 5, viewed schematically from the front and with certain parts omitted.

Referring to figure 1 of the drawings, 1 denotes a device, in its entirety, for feeding filter rods 2 in a filter tip attachment machine (not illustrated).

The feed device 1 comprises a hopper 3 filled with a mass 4 of filter rods 2, of which the outlet is enclosed by a take-up roller 5 positioned to receive the rods 2.

The roller 5 rotates anticlockwise as seen in figure 1, about an axis 6 normal to the viewing plane of this same drawing, and is furnished peripherally with a plurality of longitudinal flutes 7 extending parallel to the axis 6 of rotation, each serving to take up and retain a single filter rod 2 by suction.

The device 1 further comprises a barrier roller 8 located at the point where the take-up roller 5

rotates beyond the bottom of the hopper 3 and turning in the same direction as the take-up roller 5 about an axis parallel to the axis 6 aforementioned, of which the function is to ensure that any rods 2 not seated properly within the flutes 7 will be prevented from leaving the hopper 3.

Also illustrated in figure 1 are cutting means denoted 9 in their entirety, placed downstream of the barrier roller 8 along a predetermined feed path P followed by the rods 2 seated in the flutes 7, such as will cut through the rods 2 transversely and divide them into plugs 10 of uniform length.

The cutting means 9 might take the form of a single disc cutter 11, where the requirement is to divide each rod 2 into two plugs 10, or alternatively a pair of disc cutters 11, where the requirement is to divide each rod 2 into three plugs 10. In this latter instance, the cutters 11 will be arranged in sequence along the feed path P, as discernible from the phantom lines of figure 1, and offset axially one from another.

12 denotes a station located downstream of the cutting means 9, along the feed path P, at which the filter plugs 10 are transferred from the take-up roller 5 to a further roller 13 of which the function is to stagger the plugs 10 axially while directing them toward a successive processing station (not illustrated) of the filter tip attachment machine.

As illustrated in figures 2 to 5, the take-up roller 5 comprises an inner cylindrical body 14

coupled to conventional drive means (not illustrated) and, mounted symmetrically to the body 14 on either side of a median plane transverse to the axis 6 of the roller 5, two first annular elements 15 and 16 constituting first modules 17, also two second annular elements 18 and 19 located in contact respectively with the outer radial faces 15a and 16a of the first elements 15 and 16 and constituting second modules 20.

Finally, the roller 5 comprises two third annular elements 21 and 22 fitted respectively over the free outer ends of the two second annular elements 18 and 19 and constituting third modules 23.

Each one of the first annular elements 15 and 16, the second annular elements 18 and 19 and the third annular elements 21 and 22 presents a plurality of grooves equispaced angularly about the respective cylindrical outer surface. Accordingly, each one of the aforementioned flutes 7 presented by the take-up roller 5 will include a central portion composed of two grooves 24 and 25 afforded respectively by the two first annular elements 15, and intermediate portions consisting of two grooves 26 and 27 afforded respectively by the two second annular elements 18 and 19.

Similarly, the single flute 7 includes end portions consisting of two grooves 28 and 29 afforded respectively by the third annular elements 21 and 22.

Observing figures 2 to 5, it will be seen that the first and second modules 17 and 20 are associated

with the cylindrical body 14 of the take-up roller 5 by way of an interfacing sleeve 30, occupying a fixed angular position while remaining capable of axial movement; similarly, the third modules 23 are fitted over the second modules 20 occupying a fixed angular position and capable of axial movement.

The second annular elements 18 and 19 are held in close contact with the respective walls 15a and 16a of the first annular elements 15 and 16 by means of respective axial tension means 31. More exactly, the tension means 31 in question consist in a plurality of springs 32 and 33 distributed angularly about the periphery of the roller 5, of which the springs denoted 32 relative to one second annular element 18 are interposed between the free end of this same element and respective housings 34 afforded by the rim of a circular flange 35, disposed concentrically with the roller 5 and secured to the end of the sleeve 30 nearer the aforementioned drive means of the roller. The springs denoted 33, relative to the other second annular element 19, are interposed between the free end of this same element and respective housings 36 afforded by an annular edge 37 of the sleeve 30 at the projecting end of the take-up roller 5.

38 denotes one of a set of radial holes connecting the bottom of each groove 24, 25, 28 and 29, by way of a plurality of holes 39 in the peripheral surface of the roller 5, with a source of suction not illustrated in the drawings.

In figures 2 to 6 of the drawings, 40 denotes means, in their entirety, serving to adjust the axial position of the aforementioned flutes 7, which comprise first motion-inducing means 41 associated with the first modules 17.

More exactly, the first motion-inducing means 41 comprise a plurality of first rods 42 and 43 extending parallel to the aforementioned axis 6, intercalated and equispaced angularly around the periphery of the take-up roller 5, and coupled by way of respective lead screw assemblies respectively with each of the first annular elements 15 and 16. Importantly, the threads of the rods denoted 42 and the threads of the rods denoted 43 are of opposite hand.

The rods 42 and 43 present respective heads 44 occupying a common plane transverse to the roller 5 and incorporating teeth in mesh with a first common transmission component 45 consisting in a first ring gear 46 associated concentrically with the roller 5 and mounted rotatably within an annular housing 47 afforded by the end of the sleeve 30 at the projecting end of the roller 5.

In like manner, as indicated in figures 4 and 5, the axial adjustment means 40 will comprise second motion-inducing means 48 associated with the third modules 23. More exactly, the second motion-inducing means 48 comprise a plurality of second rods 49 and 50 extending parallel to the axis 6 of the take-up roller 5, intercalated one with another and with the

first rods 42 and 43, equispaced angularly around the periphery, and coupled by way of respective lead screw assemblies respectively to each of the third annular elements 21 and 22. Likewise in this instance the threads of the rods denoted 49 and the threads of the rods denoted 50 are of opposite hand.

Finally, the rods 49 and 50 present respective heads 51 occupying a common plane transverse to the roller 5 and parallel to the plane occupied by the heads 44 of the first rods. These heads 51 likewise incorporate teeth in mesh with a second common transmission component 52 consisting in a second ring gear 53 associated concentrically with the roller 5 and mounted rotatably within the aforementioned annular housing 47 alongside the first ring gear 46.

The projecting end of the take-up roller 5 is enclosed by a cover denoted 54.

At least one of the first threaded rods 42 and 43 and at least one of the second threaded rods 49 and 50 will afford coupling means at one end, consisting in relative sockets 56 to which an operating tool can be fitted. The sockets 56 in question are accessible by way of holes 57 provided in the end cover 54.

In operation, with reference to the example of figures 1, 2 and 4, the feed device 1 is set up to divide filter rods 2 into two plugs 10 and therefore equipped with a single disc cutter 11, indicated by a phantom line in figures 2 and 4. In this instance the first and second modules 17 and 20 are adjusted in such a way that the two first annular elements 15 and

16 remain breasted close to one another, separated only by a distance establishing a first gap 58 to accommodate the passage of the cutter 11 through the flute 7, whilst the third modules 23 are adjusted in such a manner that the overall length of the flute 7 will be substantially equal to that of the respective filter rods 2 taken up from the hopper 3.

It will be seen that, in this configuration, two second gaps 59 are created between the second annular elements 18 and 19 and the respective first annular elements 15 and 16 with which they are forced into contact by the action of the respective springs 32 and 33; the two gaps 59 are positioned symmetrically on either side of the first gap 58.

In the event of the device 1 being set up to divide each filter rod 2 into three plugs 10, the roller 5 will operate in conjunction with two disc cutters 11 positioned to engage the second gaps 59.

Once the length of the filter plug 10 has been established, the first modules 17 and the third modules 23 are adjusted for position using a suitable tool applied to the first rod 43 presenting the socket 56 and to the second rod 50 presenting the socket 56. These same two rods are caused to turn on their axes, as a result of which all the other first and second rods 42, 43, 49 and 50 are set in rotation similarly by the corresponding ring gears 46 and 53, ultimately producing the configuration of figures 3 and 5 in which, for example, the first modules 17 are distanced one from another and the third modules 23

likewise distanced one from another.

Self-evidently, by reason of the opposite handed threads mentioned previously, the modules are made to move in mutually opposite directions.

It will be observed that in order to maintain the force of suction through the bottom of the flutes 7, the first annular elements 15 and 16, and the third annular elements 21 and 22 sliding on the second annular elements 18 and 19 and the sleeve 30, are provided with annular slots 62 by which the pneumatic connection with the holes 38 and 39 can be maintained in each of the positions assumed by the modules.

To advantage, in the configuration of figures 2 and 4, the second modules 20 and the third modules 23 combine to create voids 60 allowing the passage of means by which the plugs 10 are transferred to the staggering roller 13.

In the configuration of figures 3 and 5, more particularly, a void 60 will also be created between the first modules 17.

Finally, 61 denotes a pair of alignment rings coaxial with the take-up roller 5, serving as a guide by which the filter rods 2 are restrained axially.